TRADE AND INDUSTRIAL EDUCATION
PHASE I – STANDARDS PROJECT
September, 2005

Indiana Career and Technical Education

Academic Standards for Trade and Industrial Education

Standards for fourteen (14) Trade and Industrial Education courses were written, edited, and revised by subject matter experts. These standards, developed through a cooperative effort between the Indiana Department of Education (IDOE) and the Indiana Association of Area Vocational Districts (IAAVD), represent the first step in a multi-phase effort to clarify expectations for student learning and develop consistency in instructional programs offered at various locations around the state.

The standards for each course included on the following pages have been grouped into three major categories:

Standard 1. – Workplace Competency
Standard 2. – Career Development
Standard 3. – Technical Core

After review and input from educators, representatives from business and industry, and other interested parties, these standards were finalized and posted on the Department of Education web site. Curriculum and activities for approved Trade and Industrial Education programs are expected to address all standards listed for each of the three major categories within the length of the program. Throughout the program of study, students must have opportunities to demonstrate proficiency in the technical core and related workplace competency and career development standards listed for each of the Trade and Industrial Education courses contained in this document.

As you review the standards keep in mind that: all of the courses are offered for multiple credits over two to four semesters; and, examples for the standards are provided solely for clarification purposes and should not be considered as required activities. Standards included in this document, cover the following course titles:

Automotive Collision Repair
Automotive Services Technology
Building and Facilities Management
Building Trades Technology
Computer Network Technology

Computer Repair and Maintenance Technology
Diesel Service Technology
Drafting and Computer Aided Design (CAD)
Electronics Technology
Graphic Imaging Technology
Heating, Ventilation, Air Conditioning, and Refrigeration (HVACR)
Law Enforcement
Precision Machine Technology
Welding Technology

AUTOMOTIVE COLLISION REPAIR TECHNOLOGY

DOE #5514
CIP Code: 47.0603

Automotive Collision Repair Technology includes classroom and laboratory experiences concerned with all phases of the repair of damaged vehicle bodies and frames, including metal straightening; smoothing areas by filing, grinding, or sanding; concealment of imperfections; painting; and replacement of body components including trim. Instruction should also emphasize computerized frame diagnosis, computerized color-mixing, and computerized estimating of repair costs.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards exist for this program and reflect the "I-CAR Advance Tech Curriculum."
- This course is a component of the Mechanical Repair and Precision Crafts career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.

Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 -Technical Core

Students inspect and diagnose damaged vehicle bodies and frames. They prepare repair plans and cost estimates and perform tasks needed to restore the vehicle to industry standards.

ACRT3.1 Diagnose and repair vehicle damage and perform structural analysis.
Example: Analyze the extent of damage by performing a comprehensive vehicle inspection.
Example: Use technical manuals to determine industry specifications.
Example: Compile a list of repairs that addresses metal straightening, removal of body parts and aligning body parts as needed.

ACRT3.2 Identify and repair damage to exterior components.
Example: Analyze the extent of the damage to the molding and trim.
Example: Inspect damage to decals and stripes.
Example: Perform repairs.

ACRT 3.3 Inspect, analyze and repair interior damage.
Example: Analyze damage to restraint systems.
Example: List replacements needed for carpeting or seats.
Example: Install new dash assembly.

ACRT3.4 Evaluate and repair mechanical and electrical components.
Example: Identify and service electrical and lighting system components.
Example: Inspect engine systems; diagnose damage to fuel, exhaust, and emission systems.
Example: Check air conditioning and heating systems.
Example: Remove and replace damaged parts.
Example: Explain safety and environmental practices associated with the components.

ACRT3.5 Perform welding and cutting operations.
Example: Identify materials that can be welded.
Example: Select and perform the correct welding procedure on steel and aluminum.
Example: Set up and use welding and cutting equipment.
Example: Inspect and test repairs.

ACRT3.6 Demonstrate outer body panel repairs.
Example: Use software to analyze damage
Example: Remove and replace structural and non-structural panels.
Example: Remove and replace bumpers.

ACRT3.7 Repair body parts with plastic and adhesives.
Example: Identify plastic types.
Example: Select appropriate filler material and tools needed for repair.
Example: Prepare surface and complete repair.

ACRT3.8 Perform frame inspection and repairs.
Example: Diagnose and measure structural damage.
Example: Perform stress tests on various parts.
Example: Remove and replace, repair, or align components as needed.

ACRT3.9 Perform unibody inspection, measurement, and repairs.
Example: Explain vehicle frame construction using correct terminology.
Example: Use software to analyze and measure damage.
Example: Analyze damage using different gauges and measuring systems.
Example: Complete repairs according to using vehicle specifications.

ACRT3.10 Remove and replace glass.
Example: Inspect and diagnose water leaks, dust leaks and wind noise.
Example: Repair or replace the window glass and components.
Example: Remove and replace a window regulator.

ACRT3.11 Paint and refinish a vehicle.
Example: Identify how to perform tasks in compliance with EPA and state regulations.
Example: Explain and demonstrate surface preparation techniques.
Example: Inspect and assure cleanliness of spray environment
Example: Apply undercoats and topcoats using appropriate painting and refinishing equipment and procedures.
Example: Use computer controlled paint mixing and matching system.
Example: Demonstrate problem-solving skills related to paint application defects and perform final detail work.ACRT3.12 Prepare a sequential repair plan.
Example: List all parts and materials needed to restore the vehicle.
Example: Estimate the length of time needed to complete repairs.
Example: Develop the sequence of steps needed to perform all necessary repairs.

ACRT3.13 Calculate repair estimation orders.
Example: Calculate costs for a given repair job by using a computer based or online estimating system.
Example: List costs for parts, materials, and labor.
Example: Prepare an itemized bill for customer

ACRT3.14 Practice safe working procedures during each stage of diagnosis and repair.
Example: Use protective clothing and equipment.
Example: Identify general safety rules.
Example: List toxic substances used during repairs.
Example: Explain potential environmental hazards and proper disposal techniques.

AUTOMOTIVE SERVICES TECHNOLOGY

DOE #5510
CIP Code: 47.0604

Automotive Services Technology includes classroom and laboratory experiences that incorporate training in service and repair work on all types of automotive vehicles. Included in the course is training in the use of service/repair information and a variety of hand and power tools. Instruction and practice provides opportunities for students to diagnose malfunctions, disassemble units, perform parts inspections, and repair and replace parts. Course content should address NATEF/ASE standards leading to certification in one or more of the following areas: steering and suspension; brakes; engine performance; manual transmissions and differential; automatic transmissions; electrical systems; air conditioning; and engine repair.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards are based on NATEF/ASE certifications.
- This course is a component of the Mechanical Repair and Precision Crafts career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
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1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.10 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
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1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
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2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
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2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students perform vehicle inspections to analyze and diagnose vehicle malfunctions. They complete service and repair work using established industry procedures, appropriate tools and parts.

AST3.1 Demonstrate knowledge of vehicle system.
Example: Explain basic functions and operations of all parts of the vehicle system.
Example: Use correct terminology to describe repairs.

AST3.2 Explain safety procedures.
Example: Identify personal protective equipment.
Example: Discuss environmental safety practices.
Example: List hazardous chemicals.
Example: Demonstrate safe use of hand and power tools.

AST3.3 Diagnose and perform engine repair.
Example: Locate and identify the engine, cylinder head and valve train, engine block, and the lubrication and cooling system.
Example: Conduct engine performance test or inspection to diagnose malfunction.
Example: Research technical information needed for repairs.
Example: Perform the necessary repairs or replacements.

AST3.4 Perform Computerized Engine Diagnosis and Complete Repairs
Example: Review and record diagnostic trouble codes.
Example: Read and apply information from technical manuals.
Example: Interpret codes to identify needed repairs.
Example: Analyze possible malfunctions from interrelated systems.
Example: Repair and replace worn and malfunctioning parts.
Example: Use appropriate tools to inspect, perform, and test repairs.
Example: Test, adjust, and calibrate systems.

AST3.5 Inspect and repair ignition system problems.
Example: Diagnose electronic and distributor ignition systems.
Example: Inspect and test wiring and related components.
Example: Prepare and complete a service plan.
Example: Test and adjust timing system.

AST3.6 Diagnose and service fuel, air induction, and exhaust systems.
Example: Determine necessary service to carburetor-type and injector-type fuel systems.
Example: Replace components and make required adjustments according to technical specifications.
Example: Inspect, test, and service exhaust systems.

AST3.7 Troubleshoot, clean, and replace components of emission control systems.
Example: Interpret information from emission control systems diagnosis to make repairs in the exhaust gas recirculation, gas treatment, and the intake air temperature controls.
Example: Assess early fuel evaporation controls (intake manifold temperature), evaporative emissions, controls, and clean or replace components as needed.
perform related engine service.

AST3.8 Conduct other related engine service activities.
Example: Remove and replace timing belt.
Example: Replace thermostat.
Example: Test mechanical/electrical fans and components and replace as needed.

AST3.9 Examine and service brake systems.
Example: Diagnose the hydraulic system, the brake drum, the disc brake, and power assist units
Example: Remove, clean, inspect, adjust, and replace components and fluids as needed.
Example: Diagnose miscellaneous brake system parts (wheel bearings, parking brakes, electrical, etc.) and repair as needed.
Example: Diagnose the anti-lock brake system and repair as needed.

AST3.10 Diagnose and repair electrical/electronic systems.
Example: Diagnose performance of the battery, the starting system, the charging system, the lighting system, and repair as needed.
Example: Differentiate between electrical and mechanical problems.
Example: Read and interpret electrical and wiring diagrams.
Example: Check and measure electrical circuits.
Example: Inspect and test the gauges, warning systems, the driver information systems, the horn and wiper/washer systems, as well as other accessories, and repair as needed.

AST3.11 Analyze suspension and steering systems performance and determine repairs.
Example: Diagnose the general suspension systems and the steering systems and adjust, lubricate and repair as needed.
Example: Differentiate between steering and suspension concerns.
Example: Diagnose the wheels, tires, and wheel alignment and then adjust or repair as needed.

AST3.12 Diagnose and repair automatic transmission and transaxle systems.
Example: Diagnose problems with transmission and transaxle and provide maintenance and adjustment as needed.
Example: Diagnose in-vehicle transmission or off-vehicle transmission and transaxle and repair as needed.

AST3.13 Inspect and service manual drive train and axles.
Example: Identify parts of the manual transmission system.
Example: Diagnose performance problems with the drive train, the clutch, the transmission/transaxle, the drive shaft and half shaft, the universal and constant-velocity (CV) joint, the drive axle and repair as needed.
Example: Inspect the four-wheel drive/all-wheel drive component and perform repairs as needed.

AST3.14 Evaluate and repair air conditioning systems.
Example: Check and service heating, ventilation, and engine cooling systems.
Example: Inspect, test, and repair operating systems and related controls.

BUILDING AND FACILITIES MANAGEMENT

DOE #5592
CIP Code: 46.0401
Building and Facilities Management is an instructional program that prepares students to service a variety of structures including commercial and institutional buildings. This course provides instruction in basic maintenance and repair skills related to air conditioning, heating, plumbing, electrical, and other mechanical systems. Additional activities should include classroom and laboratory experiences concerned with all phases of the care and cleaning of buildings, fixtures, and furnishings including all types of building interiors such as linoleum, plastic, terrazzo, tile, and wood floors; rugs; and, plastic, wood panel, paint, and synthetic wall coverings. Emphasis should be placed on the use of hand and power tools and selection and use of professional supplies needed for care, repair and maintenance.

- Suggested Grade Levels: 9-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.
- This course is a component of the Personal and Commercial Services career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

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Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

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1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
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Example: Describe types of confidential information and explain consequences for violations of privacy.
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Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

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2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students maintain facilities by performing servicing and cleaning tasks and repairing mechanical systems. Appropriate tools, equipment, supplies, and chemicals are selected to complete building management operations.

BFM3.1 Evaluate chemicals.
Example: Identify and evaluate floor coatings, detergents, disinfectants, and special cleaners.

BFM3.2 Explain and maintain power and hand operated equipment.
Example: Explain tools and their proper utilization.
Example: Inspect tools for damage and provide maintenance as needed.

BFM3.3 Assess appropriate resilient floor care.
Example: Plan a specific task and then select the necessary tools, materials, and equipment to accomplish the task.

BFM3.4 Determine appropriate concrete and masonry floor maintenance.
Example: Plan a specific task and then select the necessary tools, materials, and equipment to accomplish the task.

BFM3.5 Select and use appropriate carpet maintenance and care methods.
Example: Plan a specific task and then select the necessary tools, materials, and equipment to accomplish the task.

BFM3.6 Determine and use proper restroom sanitation techniques.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform the sanitizing of facilities; and clean and store all equipment and materials.

BFM3.7 Select and use proper materials and techniques for window washing.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform the window cleaning; and clean and store all equipment and materials.

BFM3.8 Plan, organize, and perform miscellaneous cleaning tasks.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; and clean and store all equipment and materials.

BFM3.9 Organize and perform painting operations.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform the painting operations; and clean and store all equipment and materials.

BFM3.10 Repair and maintain basic electrical circuits.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform electrical repairs on basic circuits; and clean and store all materials.

BFM3.11 Perform basic carpentry and woodworking skills.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform basic carpentry tasks; and clean and store all equipment and materials.

BFM3.12 Assess plumbing system maintenance and repair.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform plumbing system repair; and clean and store all equipment and materials.

BFM3.13 Assemble institutional furniture.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; and clean and store all equipment and materials.

BFM3.14 Analyze and organize techniques to maintain landscaping, and related equipment properly
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform landscaping care and maintenance; operate and maintain lawn and garden tools; identify future maintenance tasks; and clean and store all equipment and materials.

BFM3.15 Assess present and future cleaning and trash removal operations.
Example: Appropriately sequence the order of the tasks; select the tools, materials, and equipment; perform trash removal and cleaning; identify future maintenance tasks; and clean and store all equipment and materials.

BFM3.16 Assess and implement proper safety practices.
Example: Use protective clothing.
Example: Properly mix, store, and dispose of chemicals and paints.

BUILDING TRADES TECHNOLOGY

DOE #5580
CIP Codes: 46.0201 (Carpenter); 46.0101 (Mason/Tile Setter); 46.0503 (Plumber/Pipefitter) 46.0302 (Electrician); 49.0202 (Construction Equipment Operator)
Building Trades Technology includes classroom and laboratory experiences concerned with the erection, installation, maintenance, and repair of buildings, homes, and other structures using assorted materials such as metal, wood, stone, brick, glass, concrete, or composition substances. Instruction covers a variety of activities such as cost estimating; cutting, fitting, fastening, and finishing various materials; the uses of a variety of hand and power tools; and blueprint reading and following technical specifications. Knowledge concerning the physical properties of materials should also be emphasized. Instruction in plastering, masonry, tile setting, dry wall installation, plumbing, residential wiring and roofing should be covered in the course of study. Additional areas of instruction can include operation and maintenance of heavy equipment used in the construction industry and processes used for digging, grading, clearing, and excavating.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.
- This course is a component of the Building and Construction career cluster and may also be included as part of the Mechanical Repair and Precision Crafts career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.

Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students demonstrate construction skills by following project specifications and using a variety of processes, materials, tools, and equipment. They install electrical, plumbing, and heating and cooling systems and complete all work to meet governmental codes and standards.

BT3.1 Interpret building codes and standards
Example: Research information related to local and national building codes and standards, utilize codes in project planning and construction, and demonstrate knowledge of inspection procedures.

BT3.2 Read and interpret blueprints.
Example: Identify drawing symbols, interpret specifications, and interpret dimensions from the drawing and then transfer to the project.

BT3.3 Lay out the building at a site.
Example: Lay out building lines and batter boards from a reference line; utilize transit and/or builder's level; establish elevations; and develop an awareness of utility locations.

BT3.4 Estimate, prioritize, and order materials.
Example: Enhance skills in construction mathematics, calculate and estimate materials required, and communicate with suppliers by ordering and scheduling supplies.

BT3.5 Install a foundation drainage system.
Example: Develop an understanding of a drainage system; select location for a sump pump; install the drainage tile and the gravel; and install the sump pump.

BT3.6 Prepare and place footings and foundation.
Example: Plan the sequence of work; perform the layout of the project; establish elevations; construct the forms; place and finish concrete; and lay the concrete block.

BT3.7 Plan, organize, and frame a structure.
Example: Estimate and select materials needed; plan the sequence of the work; identify various framing components; perform necessary measurements and layout; cut and secure framing members; demonstrate various nailing requirements and patterns; and install necessary bracing.

BT3.8 Complete exterior of structure.
Example: Install windows and doors; install soffit, fascia, trim, and siding; install guttering; and lay brick exterior, if specified.

BT3.9 Apply appropriate roofing materials.
Example: Estimate materials; plan the sequence of the work; perform necessary measurements and layout; install appropriate underlayment; demonstrate knowledge of various roofing materials; and install roofing according to specifications.

BT3.10 Install rough and finish plumbing.
Example: Estimate and secure materials; plan the sequence of the work; install supply,, waste, and vent lines; and install fixtures and appliances.

BT3.11 Install rough and finish electrical system.
Example: Estimate and secure materials; plan the circuits; plan the sequence of work; install electrical boxes and wiring; install devices and fixtures; and install, wire, and label the service entrance.

BT3.12 Install heating and air conditioning.
Example: Estimate and secure materials; plan and locate equipment; and fabricate and install the ductwork.

BT3.13 Install drywall.
Example: Estimate and secure materials; plan the work sequence; hang the drywall; and tape, mud, and finish all joints and corners.

BT3.14 Apply interior finishes.
Example: Demonstrate knowledge of various interior finishes; estimate and secure materials; prepare surface for the finish selected; and apply the finish materials.

BT3.15 Plan and layout stair construction.
Example: Demonstrate knowledge of stairs; calculate risers and treads to appropriate dimensions; estimate and secure materials; layout, and cut stringers, risers, and treads; and assemble stairs.

BT3.16 Install interior trim.
Example: Hang interior doors; install window and door casing; install baseboard; install kitchen and bath cabinets; and install specialty item (i.e.. crown, chair molding).

BT3.17 Develop and implement a plan for site landscaping.
Example: Estimate and secure necessary supplies; determine plants, shrubs, and tree locations; and complete final landscaping.

BT3.18 Practice safe working procedures during each stage of construction.
Example: Demonstrate safe use of hand and power tools.
Example: Identify potential environmental hazards and proper disposal techniques.
Example: Model established plumbing and electrical industry safety standards.

COMPUTER NETWORK TECHNOLOGY

DOE #5532
CIP Code : 11.1002
This course prepares students to design, install, maintain, and manage both local and wide area networks. Activities include a combination of classroom instruction, e-learning, and laboratory practice that develops skills in network administration and configurations, problem diagnosis and troubleshooting, system control and maintenance, and upgrades. Additional areas of emphasis should include data backup and system security. Course content should prepare students to successfully complete one or more of industry certification exams in the areas of network installation and management.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards derived from industry certifications have been developed for this course.
- This course is a component of the Science, Engineering, and Information Technology career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.

Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students design, install, and maintain local and wide area networks. They plan and budget projects and identify security risks.

CNT3.1 Interpret the seven layer Open System Interconnection (OSI) model of communication and the function of each layer.

Example: Identify layers 1-7 of the OSI model.

CNT3.2 Evaluate the Transmission Control Protocol (TCP)/Internet Protocol (IP) reference model

Example: Explain the difference between layers 1-4 of the reference model.

CNT3.3 Identify and analyaze Local Area Network (LAN)/Wide Area Network (WAN) devices such as media, network interface cards (NIC), repeaters, hubs, bridges, switches, and routers.

Example: Explain the differences between LAN and WAN devices.

CNT3.4 Synthesize encapsulation and data flow.

Example: Identify the proper sequence of wrapping data in a protocol header.

CNT3.5 Diagram basic topologies used in networking such as bus, ring, dual ring, star, extended star, tree, hierarchical, and flat networks.

Example: Draw topology diagrams to fit various lab designs.

CNT3.6 Assess the needs and requirements of a network individually and within group projects.

Example: Perform a network expansion project based on change.

CNT3.7 Explore administration tools to maintain a network.

Example: Verify a network using the ping command.

CNT3.8 Analyze basic network structure and plan cabling.

Example: Make a straight through cable.

Example: Build various Cat-5 cables based on equipment requirements.

CNT3.9 Organize IP address classes and create subnet masks.

Example: Complete a binary numbering chart.

CNT3.10 Design and prioritize strategies, and structures to identify security risks.

Example: Develop an Access Control List (ACL).

CNT3.11 Compare routed and routing protocols and contrast the different classes of each.

Example: Given a list of protocols, properly place them in the appropriate category.

CNT3.12 Organize and perform initial router setup and configuration.

Example: Use hyperterminal to configure interfaces on routers and switches.

CNT3.13 Explore WAN technology and design.

Example: Configure a Wide Area Network.

CNT3.14 Plan, budget, and implement Virtual Information Technology (IT) projects.

Example: Design the wiring for a computer lab.

CNT3.15 Synthesize network/software/firmware upgrading.

Example: Use Trivial File Transfer Protocol (TFTP) server to upload/download Internetwork Operating System (IOS) and configuration files.

CNT3.16 Analyze what is involved in network administration.

Example: Given a network problem, troubleshoot, diagnose, and solve the network problem.
Example: Troubleshoot and repair network problems.

CNT3.17 Assess and implement proper safety practices.
Example: Maintain a clean and safe environment.
Example: Demonstrate proper procedures around electrical hazards.

COMPUTER REPAIR AND MAINTENANCE TECHNOLOGY

DOE #5536
CIP Code: 47.0104

Computer Repair and Maintenance Technology prepares students to assemble, install, program, operate, maintain, service, and diagnose operational problems in computer systems. The course includes instruction in the underlying physical sciences and supporting mathematics of computer design, installation, construction, and programming operations. The curriculum also includes the study of electrical and electronic circuits and mechanical devices used in computer construction; their combination into systems in individual computers or networked installations; and, the instruments used to detect weaknesses or failure in electrical systems in computers. Course content standards should prepare students to take industry certification exams in one or more areas of computer repair.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: Algebra, First Year
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards derived from industry certifications have been developed for this course.
- This course is a component of the Science, Engineering, and Information Technology and Mechanical Repair and Precision Crafts career clusters.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

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Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

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Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
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Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.

Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
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2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
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Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
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Example: Summarize the benefits of joining a professional organization or union connected to the career.
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2.7 Demonstrate skills and attitudes needed for lifelong learning.

Example: Establish and practice effective study skills for mastering skills and knowledge.
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Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students operate, maintain, diagnose, and service computer systems. They use science and mathematics concepts to design, analyze and trouble shoot individual computers and networked installations.

CRMT3.1 Analyze computer components and their functions.
Example: Recognize a NIC card and understand how it connects the computer to the network.

CRMT3.2 Demonstrate understanding of computer system operation.
Example: Use a multimeter to verify a circuit.

CRMT3.3 Diagnose, repair, and replace system components.
Example: Recognize a failed disk drive and diagnose the necessary repair.

CRMT3.4 Explore operating software, drivers, upgrades, and application software.
Example: Perform an upgrade to a newer operating system.

CRMT3.5 Diagnose and repair operating system and other software problems.
Example: Reinstall an operating system.

CRMT3.6 Analyze and perform system configuration.
Example: Use Microsoft configuration utility (msconfig.exe) to modify or analyze their computer configuration.

CRMT3.7 Create a complete computer system based on user requirements.
Example: In the laboratory, build a complete computer system.

CRMT3.8 Design, organize, and follow a maintenance plan.
Example: Defragment a hard drive.

CRMT3.9 Evaluate, maintain, and repair printing hardware and software.
Example: Print a test page.

CRMT3.10 Diagnose and repair network problems.

Example: Diagnose connectivity problems.

CRMT3.11 Evaluate and practice professional and ethical computer skills.
Example: Describe the difference between legal and pirated software.

CRMT3.12 Practice safe working procedures during each stage of diagnosis and repair.
Example: Explain potential environmental hazards and proper disposal techniques.
Example: Conduct installations and repairs according to approved safety standards.
Example: Demonstrate problem-solving skills when dealing with electrical hazards.

DIESEL SERVICE TECHNOLOGY

DOE #5620
CIP Code: 47.0605

Diesel Service Technology includes classroom and laboratory experiences concerned with all phases of repair work on diesel engines used to power buses, ships, trucks, railroad trains, electrical generators, construction machinery, and similar equipment. Instruction and practice is provided in the diagnostics and repair of engines, brakes, electrical/electronic systems, suspension and steering. Students will demonstrate performance of these tasks as defined by ASE/NATEF standards. Use of technical manuals, hand and power tools and of testing and diagnostic equipment are also studied in the course.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards are defined by ASE/NATEF for certified programs.
- This course is a component of the Mechanical Repair and Precision Crafts career cluster and may also be included as part of the Transportation career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.

Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.

Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

Standard 3 - Technical Core

Students diagnose, service, and repair diesel engines. They trouble shoot and repair brakes, electrical/electronic systems, and suspension and steering.

DST3.1 Analyze the fundamentals of a diesel engine.
Example: Perform diagnosis, service, and repair of diesel engine.

DST3.2 Organize and perform engine assembly and disassembly.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; and perform the removal, repair, and replacement of the engine components.

DST3.3 Diagnose and repair fuel systems.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; and perform the removal, replacement, and repair of the components.

DST3.4 Evaluate and repair electrical/electronic systems.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; perform the removal, replacement, and repair of the electrical/electronic components.

DST3.5 Diagnose and repair lubrication systems.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; and perform the removal, replacement, and repair of the malfunctioning components.

DST3.6 Analyze and repair heating/cooling system.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; perform the removal, replacement, testing, and repair of the heating/cooling system.

DST3.7 Assess and repair intake and exhaust systems.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; perform the removal, replacement, and repair of the intake and exhaust components.

DST3.8 Diagnose and repair engine performance.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; perform the removal, replacement, testing, and repair of the components.

DST3.9 Inspect and repair pneumatic/hydraulic braking systems.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; and perform the removal, replacement, and repair of the brake components.

DST3.10 Evaluate and repair suspension systems.
Example: Select the tools, materials, and equipment necessary for the job; plan the repair process; and perform the removal, replacement, and the repair of suspension systems.

DST3.11 Organize, research, and implement a complete preventive maintenance and inspection (P.M.I.)
Example: Select the tools, materials, and equipment necessary for the job; plan the P.M.I. process; and perform the service and inspection of the equipment.

DST3.12 Practice safe working procedures during each stage of diagnosis and repair.
Example: Demonstrate safe use of hand and power tools.
Example: Identify how to perform tasks in compliance with EPA and state regulations.
Example: Demonstrate proper handling of electrical components.

DRAFTING AND COMPUTER AIDED DESIGN (CAD)

DOE#5640
CIP Code: 15.1301

Drafting and Computer Aided Design (CAD) emphasizes the theory and application of drafting principles used to create detailed drawings according to exact project dimensions and specifications. Instruction includes experiences in gathering and translating realistic project data or specifications, completion of two and three dimensional drawings, and the development of computer models. The techniques learned, and software used, should be state of the art and reflect current industry standards.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for additional years of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.

- This course is a component of the Science, Engineering, and Information Technology career cluster and may also be included as part of the Manufacturing and Processing career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).

Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.6 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 **Apply effective money management strategies.**
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students use drafting principles to create designs and drawings that meet project specifications. They complete two and three-dimensional drawings using both traditional sketching techniques and computer software.

DCAD3.1 Solve design problems.

Example: Design a project with specific dimensions requiring the most efficient use of available materials.

DCAD3.2 Demonstrate basic drafting skills.
Example: Create a drawing utilizing tangent, parallel, and perpendicular lines.

DCAD3.3 Integrate knowledge of geometry.
Example: Create a drawing of specified geometric shapes.

DCAD3.4 Demonstrate knowledge of orthographic projection.
Example: Create top, front, and right side views of a machine part.

DCAD3.5 Design a variety of pictorial views.
Example: Present a three-point perspective drawing of a building.

DCAD3.6 Demonstrate knowledge of sectional views.
Example: Create sections by using full, half, offset, revolved, aligned, and removed methods.

DCAD3.7 Explore knowledge of sketching.
Example: Sketch an object on display to full scale on paper with pencil.

DCAD3.8 Integrate knowledge of appropriate measurement units, measurements, and scale.
Example: Measure a room with a desk in it, and then sketch it with appropriate dimensions.

DCAD3.9 Analyze machine and architectural blueprints.
Example: Respond to a customer's questions regarding a print.

DCAD3.10 Design two dimensional (2D) drawings manually and using Computer Aided Design (CAD).
Example: Draw their dream home in 2D.

DCAD3.11 Create 3D drawings manually and using CAD.
Example: Draw their dream home in 3D.

DCAD3.12 Organize and properly maintain safe computer workstations.
Example: Maintain clean and safe workstations by checking wires and removing trash and liquids.

DCAD3.13 Store, edit, and retrieve saved drawings.
Example: File and retrieve assignments properly for long-term projects.

DCAD3.14 Evaluate editing and layering commands.
Example: Change and create layers with drawing entities.

DCAD3.15 Manipulate files.
Example: Update files with requested changes and remove files from the backup.

DCAD3.16 Select and use appropriate screen views.
Example: Pan and zoom in a drawing to assist in editing.

DCAD3.17 Plan and design hard copy of drawings.
Example: Plot a drawing to a prescribed scale.

DCAD3.18 Analyze and adhere to current international industry standards.
Example: Produce a drawing using American Society of manufacturing Engineers (ASME) standards.

ELECTRONICS TECHNOLOGY

DOE #5684
CIP Code: 47.0101

Electronics Technology is a course which includes classroom and laboratory experiences in wiring and schematic diagrams used to design, install, and repair electrical/electronic equipment such as wireless communication devices, programmable controllers, consumer electronic products, amplifiers, computers, and related equipment. Course content will include basic theories of electricity, electronics, digital technology, and basic circuit analysis. Activities include experiences in: soldering; use of an oscilloscope, meters, signal generators and tracers; bread-boarding; circuit simulation software; and troubleshooting.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for additional years of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.
- This course is a component of the Engineering, Science and Technologies career cluster and may also be included as a component of the Manufacturing and Processing; Mechanical Repair and Precision Crafts; and Building and Construction career clusters.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.

Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.

Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.

Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students use scientific principles to design, install, and repair electrical/electronic equipment including digital circuits. Students use a variety of tools including computer software when performing troubleshooting operations.

ET3.1 Assess proper safety techniques for all types of electronic circuits and components.
Example: Student will discharge all high voltage capacitors in a circuit before making any repairs.

ET3.2 Diagnose situations using proper troubleshooting and repair techniques.
Example: Locate a circuit fault utilizing a multimeter.

ET3.3 Synthesize the meaning of the relationships among voltage, current, resistance, and power in DC circuitry.
Example: Determine current, voltage, and resistance in a given circuit using algebraic principles and Ohm's Law.

ET3.4 Analyze the physical and electrical characteristics of basic electronic components.
Example: Read, classify, and interpret the color coding of resistors.

ET3.5 Explore the principle characteristics of all types of alternating current wave forms.
Example: Use an oscilloscope to identify the period and peak-to-peak voltage of an alternating current signal.

ET3.6 Evaluate the principles and operation of AC inductive and capacitive circuits.
Example: Design and construct a simple band pass circuit.

ET3.7 Synthesize the principles and operations of diodes, transistors, and other solid state components.
Example: Use a data book to determine the operating characteristics of a transistor.

ET3.8 Troubleshoot and repair circuits with solid state components.
Example: Test a transistor utilizing a multimeter.

ET3.9 Assess the principles and operation of the common types of amplifier circuits.
Example: Measure the input and output of an amplifier utilizing an oscilloscope to determine gain.

ET3.10 Evaluate the principles and operations of common types of power supply circuits.
Example: Construct a linear power supply with a filtered output.

ET3.11 Analyze the principles and operations of common digital integrated circuits.
Example: Utilize a truth table in a digital data book.

ET3.12 Troubleshoot and repair various types of digital circuitry.
Example: Determine the proper operation of a logic gate utilizing a logic probe.

ET3.13 Explore microprocessor components and interfaces.
Example: Program a microprocessor utilizing hexadecimal code.

ET3.14 Assess essential microcomputer components and peripherals.
Example: Configure and setup a computer using available software packages.

(Reference: "*Raising the Standard: Electronic Technician Skills for Today and Tomorrow*." A project of the Electronic Industries Association and the Electronics Industries Foundation.)

GRAPHIC IMAGING TECHNOLOGY

DOE #5572
CIP Code: 10.0305

Graphic Imaging Technology will include organized learning experiences that focus on theory and laboratory activities in pre-press, press and finishing operations. Emphasis will be placed on elements of design and layout leading to computerized electronic image generation, plate preparation, pressroom operations, and finishing techniques. The course will include actual production processes in conjunction with classroom assignments embracing the technologies of printing, publishing, packaging, electronic imaging, and their allied industries.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.

- Content standards have been developed for this course.
- Students may demonstrate proficiency and earn certification(s) through Printing Industries of America and the Indiana Certificates of Technical Achievement.
- This course is a component of the Art, Media, and Communication and Manufacturing and Processing career clusters.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.

Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students design and layout visual materials using electronic imaging technologies. They print and package finished materials by applying various production processes that meet industry standards.

GIT3.1 Plan and organize pre-press operations.
Example: Perform basic stripping procedures and techniques.
Example: Create designs using proper color selections and color theory.

GIT3.2 Organize and maintain press and reproduction operations.
Example: Prepare, clean, and maintain press and press equipment.

GIT3.3 Evaluate and structure finishing operations.
Example: Perform collating operations.
Example: Construct paper padding.

GIT3.4 Synthesize related functions and allied operations.
Example: Design images used with web media.
Example: Utilize multimedia development software effectively.

GIT3.5 Assess and implement industry approved safety standards.
Example: Implement safe Press Operation practices and procedures.
Example: Identify safety considerations in bindery operations.

GIT3.6 Evaluate layout and design.
Example: Identify type fonts, styles, sizes, and their appropriate uses.
Example: Prepare thumbnail sketches and rough layout for a printed piece.
Example: Scale copy using a proportional scale.

GIT3.7 Analyze electronic imaging techniques.
Example: Distinguish between word processing/page layout and graphics software.
Example: Prepare text and copy, and utilize proper file management techniques.
Example: Prepare electronic page layout according to job specifications.

GIT3.8 Utilize reproduction photography.
Example: Identify darkroom procedures, materials, and equipment.
Example: Identify density ratings on a step guide and use information to adjust exposure.
Example: Identify equipment and procedures to make basic halftone exposures.

GIT3.9 Assess and implement proper image assembling/platemaking techniques.
Example: Compare stripping a negative using a ruled and unruled masking sheet.
Example: Assemble and strip spot color.

GIT3.10 Plan and organize offset press operation.
Example: Print a single color job using a metal plate on a variety of stocks.
Example: Print a multicolor job; evaluate print quality and make needed adjustments to improve the printed piece.

GIT3.11 Utilize proper finishing/bindery techniques.
Example: Calculate basic paper and draw a master cutting diagram for making cuts.

Example: Produce correctly made pads of paper; produce side and saddle stitched products; measure to drill and make holes for a three ring notebook.

HEATING, VENTILATION, AIR CONDITIONING, AND REFRIGERATION (HVACR)

DOE #5496
CIP Code: 47.0201

This course provides students with classroom and laboratory experiences concerned with heat generation, ventilation, air conditioning and cooling/refrigeration systems. Instruction emphasizes proficiency in the design, development, testing and installation of the various systems with learning experiences focused on the operation and trouble-shooting of equipment, including the controls needed for residential and commercial use. Course content also includes instruction in blueprint reading, the use of technical reference manuals, the diagnosis and repair of malfunctions, and the use of hand tools and machines to fabricate sheet metal items made of steel, copper, stainless steel, and aluminum.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.
- This course is a component of the Mechanical Repair and Precision Crafts and Building and Construction career clusters and may also be included as a component of the Engineering, Science and Technologies career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.

Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.

Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students design, install, operate, and troubleshoot equipment and controls used for residential and commercial applications of heat generation, ventilation, air conditioning, and cooling/refrigeration systems. Students select and use a variety of tools, machines, and materials to perform fabrication operations.

HVACR3.1 Assess and implement proper safety practices.
Example: Perform work around electrical hazards, handle refrigerant, and conduct all work according to approved safety practices and in compliance with EPA and state standards.

HVACR3.2 Explore and use appropriate hand tools and measuring devices.
Example: Use hand tools to install an air conditioning unit.

HVACR3.3 Select and use appropriate power tools.
Example: Use power tools during the installation of a heating unit.

HVACR3.4 Organize, rig and move material and equipment.
Example: Estimate size, weight, and center of gravity of equipment prior to moving it to a specified location.

HVACR3.5 Fabricate and connect tubing and piping.
Example: Cut, clean, and ream various types of tubing and pipe during an installation.

HVACR3.6 Solder and braze materials.
Example: Solder and braze tubing and fittings after the proper preparation of materials.

HVACR3.7 Synthesize knowledge of electricity.
Example: Identify various types of circuits and HVAC electrical components.

HVACR3.8 Organize and plan servicing of heating systems.
Example: Explain the various types of heating systems sequence of operation.

HVACR3.9 Analyze and service mechanical refrigeration systems.
Example: Explain the four major components of a basic refrigeration system.

HVACR3.10 Evaluate cooling systems.
Example: Explain the various types of cooling systems sequence of operation.

HVACR3.11 Synthesize knowledge and understanding of Section 608 Refrigeration Transition and Recovery Certification.
Example: Complete an EPA approved certification exam.

HVACR3.12 Analyze and create blueprints using a CAD system.
Example: Install HVARC equipment utilizing a construction print.

HVACR3.13 Explore distribution system design.
Example: Construct the various air distribution systems such as extended plenums.

HVACR3.14 Evaluate layout and fabrication of sheet metal.
Example: Layout and fabricate a rectangular duct.

LAW ENFORCEMENT

DOE #5822
CIP Codes: 43.0107

Law Enforcement includes specialized classroom and practical experiences related to public safety occupations such as law enforcement, loss protection services, and homeland security. Training is based on standards and content similar to that provided by officially designated law enforcement agencies. Instruction includes procedures for patrolling on foot or in an automobile during the day or at night; dealing with misdemeanors, felonies, traffic violations, and accidents; investigative and evidence collection procedures; making arrests; and testifying in court. Oral and written communication skills should be reinforced through activities that model public relations and crime prevention efforts as well as the preparation of police reports.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- Programs may provide instruction that concentrates in one protective service occupation or may sequence training in several career areas over a two-year period.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.
- This course is a component of the Law, Public Safety, and Security career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.

Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.

Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
Example: Revise and extend career plans to include further training after high school.
Example: Enroll in classes that provide dual credit and plan for accelerated completion of a certificate or degree program.
Example: Participate in career days and college fairs to discuss opportunities with representatives from colleges, apprenticeship programs, and business and industry.

2.4 Prepare for exams leading to certifications recognized by business and industry.
Example: Practice for networking certification exams.
Example: Investigate timelines, locations, and costs for certifications related to the career field.

2.5 Develop skills needed to enter the workforce.
Example: Create a portfolio that contains a resume, samples of work products, and other visual and print materials that document skills and abilities.
Example: Participate in a real or mock job interview.
Example: Complete a job application.

2.6 Evaluate resources that keep workers current in the career field.
Example: Summarize the benefits of joining a professional organization or union connected to the career.
Example: Compile a list of professional journals, trade magazines, and web sites.

2.7 Demonstrate skills and attitudes needed for lifelong learning.
Example: Establish and practice effective study skills for mastering skills and knowledge.
Example: Analyze the impact of changing technologies of the workforce and explain how this affects the need for continuous education.
Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students learn and practice law enforcement and crime prevention procedures related to various public safety occupations. They use critical thinking skills and problem solving techniques to conduct investigations and collect evidence.

LE3.1 Research the history and evolution of law enforcement.
Example: Read and report on a variety of historical agencies and individuals.

LE3.2 Organize and conduct a criminal investigation.
Example: Perform a criminal investigation of a mock crime scene.

LE3.3 Analyze the nature of crime.
Example: Explore and deliver an oral report on the nature of crime.

LE3.4 Demonstrate an understanding of crime and justice in the United States.
Example: Identify the roles of various criminal justice agencies.

LE3.5 Demonstrate an understanding of the constitution of the United States.
Example: Research appropriate case law related to a current event.

LE3.6 Practice appropriate conduct at the crime scene.
Example: Model appropriate practices during mock criminal investigations.

LE3.7 Demonstrate an understanding of law enforcement ethics.
Example: Make ethical choices during role-playing exercises.

LE3.8 Identify physical evidence.
Example: Handle and preserve evidence according to prescribed procedure.

LE3.9 Demonstrate appropriate speech, language, and listening skills.
Example: Conduct interviews.

LE3.10 Collect and present facts.
Example: Perform interrogations.

LE3.11 Produce accurate reports.
Example: Write reports with appropriate attention to proper writing and language rules.

LE3.12 Perform a follow-up investigation.
Example: Locate witnesses and evidence related to a crime.

LE3.13 Demonstrate an understanding of criminal justice system definitions.
Example: Practice the rules of evidence during investigations.

LE3.14 Demonstrate an understanding of the arrest procedure and probable cause.
Example: Conduct a mock arrest of a suspect.

LE3.15 Demonstrate an understanding of searching and arresting suspects.
Example: Recite the Miranda warning and waiver.

LE3.16 Demonstrate an understanding of rules of evidence.
Example: Write a report on the "fruit of the poison tree".

LE3.17 Understand the use of force.
Example: Practice defensive tactics and force continuum.

LE3.18 Demonstrate an understanding of the administration of justice.
Example: Practice public relations and adhere to a chain of command during arrest simulations.

LE3.19 Demonstrate an understanding of corrections and incarceration.
Example: Visit a correctional institution.

LE3.20 Demonstrate an understanding of juvenile and adult justice.
Example: Differentiate between juvenile and adult crime.
Example: Deliver an oral report on the history of crime.

LE3.21 Use mathematical applications in a criminal investigation.
Example: Calculate the rate of speed of a vehicle based on skid marks.

LE3.22 Use scientific concepts to locate, preserve, and examine evidence
Example: Compare plaster casts of footprints taken during an investigation.

LE3.23 Assess and implement approved safety procedures.
Example: Use appropriate protective clothing and equipment.
Example: Follow fire arms safety guidelines.

PRECISION MACHINE TECHNOLOGY

DOE #5782
CIP Code: 48.0501

Precision Machine Technology includes a wide range of classroom and laboratory experiences that develop skills and knowledge in the shaping of metal parts. Emphasis is placed on basic precision machining operations including the use of lathes, drill presses, and grinders, in addition to mill and bench work. Instruction includes the use and care of other precision tools such as micrometers, indicators, combination squares, scales, and calipers. Advanced instruction should include preparation in the use of Computer Numerically Controlled (CNC) machines that reflect current industry practices. Application of mathematical skills and blue print reading is part of the daily experience.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: Algebra and Geometry
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.
- This course is a component of the Manufacturing and Processing career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.
Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

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Example: Investigate levels of education and training needed for upward mobility in a career field.
Example: Identify opportunities for career path advancement and revise career goal or objectives.

2.8 Apply effective money management strategies.
Example: Establish a budget and savings/checking accounts.
Example: Research a variety of savings and investment strategies.
Example: Investigate student loan interest rates and repayment schedules.
Example: Compare various credit and loan options.
Example: Evaluate employer benefit packages.

STANDARD 3 - Technical Core

Students use precision tools and mathematical skills to design, shape, and produce metal parts. Students apply this knowledge to the use of computer numerically controlled machines commonly used in industry settings.

PMT3.1 Organize and coordinate safe shop practices and tool maintenance.
Example: Perform tool sharpening on a pedestal grinder.
Example: Follow safe work practices based on written and verbal instructions.
Example: Clean, maintain, and respond appropriately to safety hazards on all benchwork tools and conventional and CNC machine tools.
Example: Maintain the cleanliness of the general work area.

PMT3.2 Perform measurement/layout/inspection operations.
Example: Measure a variety of stock utilizing calipers and micrometers.
Example: Develop an inspection plan and inspect simple parts using precision tools and techniques.
Example: Conduct quality control of a finished project and of a multiple part production run.

PMT3.3 Perform mathematical computations.
Example: Convert fractions to decimals.
Example: Interpret tolerances to .0001"
Example: Construct projects with metric dimensions.
Example: Apply trigonometric tables to lathe tool adjustments.

PMT3.4 Demonstrate written and oral communication skills.
Example: Prepare reports on the compliance of the parts inspected during the quality control process.
Example: Communicate technical and non-technical information, messages, and ideas in writing using expressions and vocabulary commonly found in the metalworking industry. This writing includes the completion of forms, information sheets, reports, group meeting materials, and short memos.

PMT3.5 Develop a process plan for a part requiring milling, drilling, turning, or grinding.
Example: Complete an operation sheet detailing the process plan and required speeds and feeds.

PMT3.6 Read and interpret blueprints.
Example: Manufacture a wheel puller from a machine drawing.

PMT3.7 Use geometric knowledge in the interpretation of machine drawings.
Example: Layout radius and tangent lines on a piece of material.

PMT3.8 Perform bench work using a surface plate, surface gage, layout height gage, and combination set.
Example: File, punch, deburr, and cut material with hand tools.
Example: Scribe a part accurately on a piece of material prior to constructing the part.

PMT3.9 Use bench vises, hand drills, hand taps, tap wrench, files, scrapers, and coated abrasives to deburr parts and use arbor presses to perform press operations.
Example: Use hand drill and tap a hole in a part and insert a stud into the tapped hole.
Example: Use hand drill and press fit a bushing into the hole.

PMT3.10 Perform pedestal grinder operations.
Example: Prepare a cutting tool with appropriate geometry.
Example: Grind a chamfer on a part.
Example: Ring test grinding wheels, perform visual safety inspection, and mount and dress a grinding wheel in preparation for surface grinding.

PMT3.11 Perform power saw operations.
Example: Cut round stock to length.

PMT3.12 Perform drill press operations.
Example: Drill holes in stock of various diameters.
Example: Construct a part requiring reaming, spot facing, countersinking, counterboring, and counterdrilling with at least one hole being a blind hole, one a through hole, and one will be power tapped.

PMT3.13 Operate a surface grinding machine.

Example: Convert a semi-finished part to a precision finished part including the precision finishing of the six faces of the part to tolerances for squareness, size, and to equal thicknesses.

PMT3.14 Perform lathe operations.
Example: Setup and carry out between centers turning operations for straight turning.
Example: Construct a scribe with sharpened point and knurled handle.

PMT3.15 Perform vertical and horizontal milling machine operations.
Example: Setup and perform squaring up the six surfaces of a block to tolerance.
Example: Construct a mold.

PMT3.16 Program and operate computerized numerical control (CNC) machines.
Example: Manufacture a part applying the principles of three-dimensional coordinate planes in the development a program for the production of the part on a CNC milling machine.
Example: Program a CNC machine to produce a product of the student's choice.
Example: Perform problem solving and decision making.
Example: Repair and maintain a machine.

* Note: These standards are consistent with the American National Standards Institute (ANSI) / National Institute for Metalworking Skills (NIMS) standards project made possible by a grant from the U.S. Department of Labor (Grant No. F-4038-3-00-80-75) and the contributions of time and expenses from many in the metalworking industry.

WELDING TECHNOLOGY

DOE #5776
CIP Code: 48.0508
Welding Technology includes classroom and laboratory experiences that develop a variety of skills detailed in American Welding Society (AWS) Entry Level Guidelines and Certifications. Areas of study include electric welding and flame and plasma cutting. Instructional activities emphasize properties of metals, safety issues, blueprint reading, electrical principles, welding symbols, and mechanical drawing through projects and exercises that teach students how to weld industrial metals in four basic welding positions.

- Suggested Grade Levels: 11-12
- Recommended Prerequisites: None
- A four to six credit course over two semesters. The nature of this course allows for a second year of instruction provided that content and standards address higher levels of knowledge.
- A Core 40 directed elective as part of a technical career area.
- This course qualifies as an Academic Honors Diploma elective.
- Content standards have been developed for this course.
- Students may demonstrate proficiency and earn certification(s) through AWS.
- This course is a component of the Manufacturing and Processing career cluster.

STANDARD 1. Workplace Competency

Students will demonstrate appropriate behaviors and characteristics needed for career success and for completion of further education and training programs. They

will apply academic skills and knowledge to workplace tasks and develop positive relationships with co-workers, community members, and family.

1.1 Allocate the appropriate resources for task completion.
Example: Create an action plan that identifies required materials and equipment, staffing, and financial resources as well as timelines for completion of a classroom project.

1.2 Demonstrate effective interpersonal skills.
Example: Contribute to completion of group assignments by working cooperatively in a team setting.
Example: Develop customer service policies that build repeat business and customer loyalty.
Example: Apply negotiation skills to resolve team conflicts.

1.3 Develop leadership skills.
Example: Participate in student clubs and school activities to practice leadership, team, and interpersonal skills.
Example: Demonstrate the ability to influence others in a productive manner.
Example: Identify skills required for effective leadership.
Example: Research the life of a respected leader and summarize personal and professional characteristics that lead to his/her success.

1.4 Establish positive relationships with people from diverse backgrounds.
Example: Organize a team comprised of students from different cultures, genders, and learning abilities and successfully complete a class assignment.

1.5 Research, analyze, and use data for work assignments.
Example: Identify, locate, and collect data needed for a community-based project.
Example: Organize and communicate data using spreadsheets, graphs, or other visuals.
Example: Compile, evaluate, and display product performance data.

1.6 Apply effective critical thinking, decision making, and problem-solving techniques.
Example: Identify workplace concerns, problems, or malfunctions and recommend appropriate solutions.
Example: Critique a design, process, or system and develop improvements.
Example: Describe steps used in the decision making process.

1.7 Select and use appropriate tools and technology.
Example: Research and analyze emerging technologies in a specific occupational area and prepare a report using word-processing software.
Example: Demonstrate acceptable procedures for use of common tools.
Example: Operate power equipment in accordance with established safety procedures.
Example: Organize and maintain a List Serve for communicating information about career-technical student organization activities.

1.8 Implement quality assurance measures and safeguards.
Example: Demonstrate compliance with manufacturers' required specifications and/or industry standards.
Example: Analyze statistical data to determine changes or improvements.

1.9 Read and interpret written materials.

Example: Locate service information in a technical manual and follow repair procedures.
Example: Review and implement written safety procedures for hazardous equipment.

1.10 Apply written communication skills.
Example: Prepare a set of instructions for completing a workplace task.
Example: Write a business letter or memorandum using appropriate format.

1.11 Demonstrate effective listening and speaking skills.
Example: Restate verbal instructions in one's own words.
Example: Prepare a presentation or demonstration to be given in a formal setting. (i.e., a senior project)

1.12 Perform appropriate mathematical calculations correctly.
Example: Create and interpret graphs and charts commonly used in the career area.
Example: Prepare a budget estimating total project costs.

1.13 Exhibit a responsible work ethic.
Example: Establish a regular and reliable attendance pattern.
Example: Complete work on assigned tasks without undue distraction by associates or conditions.
Example: Performs tasks to meet or exceed industry standards.

1.14 Demonstrate accepted standards for ethical behavior.
Example: Select an ethical course of action upon reviewing case studies of workplace scenarios.
Example: Describe types of confidential information and explain consequences for violations of privacy.
Example: Accurately and honestly complete time card for on-the-job training.
Example: Interacts with co-workers and supervisors in a respectful manner.

STANDARD 2 - Career Development

Students will demonstrate the skills and behaviors required for self-sufficiency and management of their personal and professional lives. They will apply planning, research, and writing skills to the development of strategies for educational and employment success.

2.1 Establish a personal career goal and develop objectives for achieving the goal.
Example: Identify potential career fields based on results of a career interest inventory.
Example: Describe how personal interests and abilities affect career decisions.
Example: Explain a process used to develop career plans.
Example: Connect career goals and objectives to education and training programs.
Example: Develop a flexible career plan using personal time lines to meet goals and objectives.

2.2 Evaluate employment and career pathway opportunities related to established career interest(s).
Example: Use print and electronic resources to explore and analyze occupations matching career interests.
Example: Locate and evaluate labor market demand and wage information.
Example: Participate in work-based learning experiences to clarify career interests.

2.3 Create a continuing education plan that identifies further education and training options.
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STANDARD 3 - Technical Core

Students perform welding and cutting processes on a variety of industrial metals. They read and interpret blueprints and mechanical drawings and complete projects to meet industry standards.

WT3.1 Demonstrate safe practices according to American National Standards Institute safety standards.
Example: Demonstrate safety during welding project construction.
Example: Deliver oral and written reports on shop and equipment safety standards.

WT3.2 Analyze and interpret blueprints.

Example: Read and interpret lines, dimensions, and notes on multi-view or pictorial drawings.
Example: Read and interpret the basic welding symbols and supplementary symbols on drawings or sketches.
Example: Layout and fabricate a steel trailer from a mechanical drawing.

WT3.3 Evaluate and identify basic metals.
Example: Identify selected metals by appearance, color, and weight; identify metal shapes for welding.
Example: Conduct the following tests on specified metals: magnet test, spark test, and chisel test.

WT3.4 Assess and perform oxyacetylene metal cutting skill and practices.
Example: Set up and adjust oxyacetylene station; light and adjust flame; close down oxyacetylene station.
Example: Lay out and cut angles, circuits, and patterns.

WT3.5 Understand electrical fundamentals.
Example: Setup a shielded metal arc welding machine to the proper polarity.

WT3.6 Perform shielded metal arc welding.
Example: Perform butt welds in all positions.

WT3.87 Perform gas metal arc welding.
Example: Perform corner joint welds in all positions.
Example: Perform welds on thin material.
Example: Construct a multiple pass t-joint fillet weld in the flat, horizontal, vertical and overhead positions.

WT3.8 Perform flux cored arc welding.
Example: Perform vee joint welds in the flat position.

WT3.9 Perform gas tungsten arc welding.
Example: Perform corner welds on aluminum.
Example: Perform butt welds on stainless steel.

WT3.10 Perform manual and automatic oxyfuel gas cutting.
Example: Perform straight, curve line, and bevel cutting.

WT3.11 Perform air carbon arc cutting.
Example: Use air arc process to repair a poor weld.

WT3.12 Perform plasma arc cutting.
Example: Cut a circle using the plasma process.

WT3.13 Perform welding inspection and testing.
Example: Identify good and bad welds.
Example: Identify weld flaws and their causes.

WT3.14 Perform fabrication skills.
Example: Fabricate a wheelbarrow shell from a drawing.

WT3.15 Understand welding metallurgy.
Example: Identify steel and its various alloys.
Example: Identify aluminum and other non-ferrous materials.